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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/874,999	06/07/2001	Ian Edward Day	SGU-43	5528

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EXAMINER

KIANNI, KAVEH C

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 01/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/874,999

Applicant(s)

DAY, IAN EDWARD

Examiner

Kevin C Kianni

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☒ Claim(s) 20 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to because: (a) certain/essential numbered elements of the drawings in figures 1-6 and 11-12 are not textually labeled. Proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Allowable Subject Matter

2. Claim20 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 20, is objected because the prior art , in combination with other limitations of the base claim, does not teach wherein the waveguide comprises a series of two or more curved portions curving in alternating directions, each having an n-doped region adjacent the outer side of the curved portions and a p-doped region of the inner side thereof so as to form a series of diodes of alternating polarity along the length of the waveguide.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1, 5-6 and 8-19 are rejected under 35 U.S.C. 102(e) as being anticipated by House (US 6298177).

Regarding claim 1, House teaches a substrate 14 (shown at least in fig. 3, item 14); and an integrated optical waveguide 12 extending across the substrate 14 (see col. 3, lines 16-17), two doped regions (see fig. 5, items 58, 80, 77 and 78; also see col. 5, line 55-col. 6, line 18) being provided such that an electrical signal 70 can be applied across the doped regions 58 to alter the density of charge carriers within the waveguide (see col. 1, lines 30-36), the doped regions each comprising a plurality of doped areas spaced apart from each other along the length of the waveguide (see fig. 5, items 58, 80, 77 and 78; also col. 5, line 58-col. 6, line 19).

Regarding claim 5, House further teaches wherein the doped regions each comprise at least four doped areas spaced part from each other in a direction along the length of the waveguide (see fig. 5, items 80, 77 and 78 have at least more regions—multi-regions—along side the length of waveguide 12; see col. 6, lines 3-18).

Regarding claim 6 and 8-11, House further teaches wherein the doped regions form p-i-n diodes across the waveguide (see col. 1, lines 20-29); wherein the waveguide comprises silicon (fig. 2, item 24); wherein the waveguide is a silicon rib waveguide (fig. 2, item 24; see abstract); wherein the two doped regions are provided on opposite sides of the waveguide (see fig. 3, items 56 and 58); wherein the doped regions are provided in areas of silicon adjacent the rib waveguide (fig. 2, items 20, 22 and 24);

Regarding claim 12-15, House further teaches wherein the waveguide has a substantially straight portion (fig. 1, item 12) and the doped regions are arranged so that the density of charge carriers can be altered within said substantially straight portion of the waveguide (see fig. 1, item 12 and col. 1, lines 22-36); wherein the doped areas are electrically connected so a plurality of diodes formed thereby are connected in series (see fig. 3, items 56, 58, 62, 63 and 60; also col. 1, lines 20-30); wherein electrical connections to and/or between the doped areas are provided by electrical contacts (fig. 3, item contacts 57 and 59); wherein the device is used as an adjustable attenuator (see abstract; wherein the attenuation occurs as a result of change in the refractive index).

Regarding claim 16, House further teaches wherein the device is used as a phase modulator (see col. 1, lines 43-45).

Regarding claim 17, House teaches an electro-optic device (shown in at least fig. 5) comprising: a substrate 14; and an integrated optical waveguide extending across the

substrate (see col. 3, lines 16-17), at least one portion of the waveguide being curved (shown in fig. 4 and 5, item waveguide portions 40 and 12; the curved portions 80, 71, 72, 77, 78 and 40 that is being curved before adjoining coupler 42), two doped regions being provided (see fig. 5, items 58, 80, 77 and 78; also see col. 5, line 55-col. 6, line 18) such that an electrical signal can be applied across the doped regions to alter the density of charge carriers within the curved portion of the waveguide (see fig. 5, items 58, 80, 77 and 78; also col. 5, line 58-col. 6, line 19).

Regarding claim 18, House further teaches wherein the doped regions each comprise a plurality of doped areas spaced apart from each other along the length of the waveguide (see fig. 5, items 58, 80, 77 and 78; also col. 5, line 58-col. 6, line 19).

Regarding claim 19, House further teaches 'Wherein an n-doped region is provided adjacent an outer side of the curved portion of the waveguide and a p-doped region adjacent an inner side of the curved portion (shown in fig. 5, item n-doped region adjacent an outer side of the curved portion of the waveguide 81 and a p-doped region adjacent an inner side of the curved portion 80).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over House.

Regarding claim 2-4, House teaches all limitations of claim 1. However, House does not specifically teach wherein the spacing between adjacent doped areas is in the range of 250 to 300 microns and wherein each of the doped areas has a length in a direction along the waveguide of at least 1 mm, and wherein each of the doped areas has a length in a direction along the waveguide of 10 mm or less. Nevertheless, House states that the width of the waveguide/rib is about 1 micron and that the width of other segments of the device such as dopant/depletion regions are selected in relationship to the width of the rib/waveguide and the doped region/PN junction along the waveguide/rib extends for a sufficient axial extent for a required phase shift (see col. 4, lines 48-58). Therefore, it would have been obvious to a person of ordinary skill in the art, when the invention was made to modify House's phase shifting device as to achieve a desired length or size of optical components, since such modification would improved device effecting phase modulation in a silicon optical waveguide (col. 1, lines 43-45) and since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

7. Claims 7 rejected under 35 U.S.C. 103(a) as being unpatentable over combination of House and May (US 4997246).

Regarding claim 7, House teaches all limitations of claim 6. However, House does not specifically teach wherein the doped areas are arranged in an alternating sequence of p-doped areas and n-doped areas along the length of the waveguide. This limitation is taught by May. May teaches an electro-optic device that includes the above limitation (see fig. 3, item 58). Thus, May provides a modulator that is amenable to fabrication with VLSI circuits (col. 3, lines 21-24). Thus, it would have been obvious to person of ordinary skill in the art when the invention was made to modify Hous' waveguide areas 12, with that of May's waveguide structure 58 in order to produce an electro-optic device that includes the above limitations. Since the resultant optical device would modulate light transmitted in a semiconductor waveguide that includes phase modulation (col. 1, lines 4-7).

Citation of Relevant Prior Art

8. Prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In accordance with MPEP 707.05 the following references are pertinent in rejection of this application since they provide substantially the same information disclosure as this patent does. These references are:

Friedman 4958898

Crampton 2265252

Crampton 5757986

Crampton et al. 5908305

Amann et al. 5008893

Lorenzo et al. 4877299

Larkins 5349599

Fischer et al. 6301037

Heinich et al. 4758092

These references are cited herein to show the relevance of the apparatus/methods taught within this reference as prior art.

Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaveh Cyrus Kianni whose telephone number is (703) 308-1216. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 6:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font, can be reached at (703) 308-4881.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 308-7722, (for formal communications intended for entry)

or:

(703) 308-7721, (for informal or draft communications, please label "PROPOSED" or "DRAFT")


Hand delivered responses should be brought to Crystal Plaza 4, 2021 South Clark Place, Arlington, VA., Fourth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956.

Kevin Cyrus Kianni
Patent Examiner
Group Art Unit 2877

December 20, 2002

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